



SEQUENCE LISTING

<110> Dunn-Coleman, Nigel
Langdon, Timothy
Morse, Phillip

<120> Manipulation of the Phenolic Acid
Content and Digestibility of Plant Cell Walls by Targeted
Expression of Genes Encoding Cell Wall Degrading Enzymes

<130> GC648-2

<140> US 09/991,209
<141> 2001-11-16

<150> US 60/249,608
<151> 2000-11-17

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<213> Aspergillus niger

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35 40 45	
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50 55 60	
Ser Gln Thr Asp Ile Asn Gly Trp Ile Leu Arg Asp Asp Ser Ser Lys	
65 70 75 80	
Glu Ile Ile Thr Val Phe Arg Gly Thr Gly Ser Asp Thr Asn Leu Gln	
85 90 95	
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100 105 110	
Asn Gly Cys Glu Val His Gly Gly Tyr Tyr Ile Gly Trp Val Ser Val	
115 120 125	
Gln Asp Gln Val Glu Ser Leu Val Lys Gln Gln Val Ser Gln Tyr Pro	
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Asp Tyr Ala Leu Thr Val Thr Gly His Ser Leu Gly Ala Ser Leu Ala	
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Tyr Thr Phe Gly Glu Pro Arg Ser Gly Asn Gln Ala Phe Ala Ser Tyr	
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195 200 205	
Arg Val Thr His Ala Asn Asp Gly Ile Pro Asn Leu Pro Pro Val Glu	
210 215 220	
Gln Gly Tyr Ala His Gly Gly Val Glu Tyr Trp Ser Val Asp Pro Tyr	
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<223> retention sequence

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<223> retention sequence encoding sequence

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<212> PRT
<213> Artificial Sequence

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<223> FAE-linker-frameshift sequence

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<211> 48
<212> DNA
<213> Artificial Sequence

<220>
<223> FAE-linker-frameshift sequence

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 <213> Hordeum sp.

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 35 40

<210> 10
 <211> 134
 <212> DNA
 <213> Hordeum sp.

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 <211> 46
 <212> PRT
 <213> Rattus sp.

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 20 25 30
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 35 40 45

<210> 12
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 <212> DNA
 <213> Rattus sp.

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<210> 13
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 <213> Solanum sp.

<220>
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 <222> (1)...(50)
 <223> Xaa = Any Amino Acid

<400> 13

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 Ala Ala
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<210> 14
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 <212> DNA
 <213> Solanum sp.

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 <213> Artificial Sequence

<220>
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<212> PRT
<213> Artificial Sequence

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<222> (1)...(311)
<223> Xaa = Any Amino Acid

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Glu	Asp	Leu	Tyr	Ser	Arg	Leu	Val	Glu	Met	Ala	Thr	Ile	Ser	Gln	Ala
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<210> 17
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<212> DNA
<213> Artificial Sequence

<220>
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<400> 17

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<223> Xaa = Any Amino Acid

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35 40 45
Glu Asp Leu Tyr Ser Arg Leu Val Glu Met Ala Thr Ile Ser Gln Ala
50 55 60
Ala Tyr Ala Asp Leu Cys Asn Ile Pro Ser Thr Ile Ile Lys Gly Glu
65 70 75 80
Lys Ile Tyr Asn Ser Gln Thr Asp Ile Asn Gly Trp Ile Leu Arg Asp
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Asp Ser Ser Lys Glu Ile Ile Thr Val Phe Arg Gly Thr Gly Ser Asp
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Thr Asn Leu Gln Leu Asp Thr Asn Tyr Thr Leu Thr Pro Phe Asp Thr
115 120 125
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130 135 140
Trp Val Ser Val Gln Asp Gln Val Glu Ser Leu Val Lys Gln Gln Val
145 150 155 160
Ser Gln Tyr Pro Asp Tyr Ala Leu Thr Val Thr Gly His Xaa Leu Gly
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Ala Ser Leu Ala Ala Leu Thr Ala Ala Gln Leu Ser Ala Thr Tyr Asp
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Asn Ile Arg Leu Tyr Thr Phe Gly Glu Pro Arg Ser Gly Asn Gln Ala
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Pro Pro Val Glu Gln Gly Tyr Ala His Gly Gly Val Glu Tyr Trp Ser
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Ala Tyr Ala Asp Leu Cys Asn Ile Pro Ser Thr Ile Ile Lys Gly Glu
   65          70          75          80
Lys Ile Tyr Asn Ser Gln Thr Asp Ile Asn Gly Trp Ile Leu Arg Asp
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Asp Ser Ser Lys Glu Ile Ile Thr Val Phe Arg Gly Thr Gly Ser Asp
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Gly Glu Lys Ile Tyr Asn Ser Gln Thr Asp Ile Asn Gly Trp Ile Leu
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Asp Thr Leu Pro Gln Cys Asn Gly Cys Glu Val His Gly Gly Tyr Tyr
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<212> DNA

<213> Artificial Sequence

<220>

<223> pTP11-1 vector

<400> 41

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<211> 301

<212> PRT

<213> Artificial Sequence

<220>

<223> pTP11-1 vector

<221> VARIANT

<222> (1)...(301)

<223> Xaa = Any Amino Acid

<400> 42

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<212> DNA
<213> Artificial Sequence

<220>
<223> actin promoter

<400> 43

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cgtggggggcc	ggaaaagcga	ggaggatcgc	gagcagcgcac	gaggccggc	cctccctccg	780
cttccaaaga	aacgcccccc	atcgccacta	tatacatacc	ccccctctc	ctccatccc	840
cccaacccta	ccaccaccac	caccaccacc	tcctccccc	tcgctgccc	acgacgagct	900
cctcccccct	ccccctccgc	cggccgggt	aaccaccccg	cccctctc	ctttcttct	960
ccgttttttt	tttcgtctcg	gtctcgatct	ttggccttgg	tagttgggt	gggcgagagc	1020
ggcttcgtcg	cccagatcgg	tgcgcggag	gggcgggatc	tcgcggctgg	cgtctccggg	1080
cgtgagtcgg	cccgatcct	cgcgggaaat	ggggctctcg	gatgttagatc	ttctttctt	1140
cttcttttttgc	tggtagaatt	tgaatccctc	agcattgttc	atcggtagtt	tttctttca	1200
tgtttgtga	caaatacgac	ctcgtcgcca	gttttttgt	aggtagaagc	ttaccatgg	1259

<210> 44
<211> 27
<212> PRT
<213> Artificial Sequence

<220>
<223> aleurain-NPIR delete structure

<400> 44

Met	Ala	His	Ala	Arg	Val	Leu	Leu	Leu	Ala	Leu	Ala	Val	Leu	Ala	Thr
1					5				10				15		
Ala	Ala	Val	Ala	Val	Ala	Ser	Ser	Arg	Ala	Ala					
					20				25						

<210> 45
<211> 93
<212> DNA
<213> Artificial Sequence

<220>
<223> aleurain-NPIR delete structure encoding sequence

<400> 45

aagcttacca	tggcccacgc	ccgcgtcctc	ctcctggcgc	tcgcccgtgc	ggccacggcc	60
gcccgtcgcc	tcgcctc	ccgcgcggcc	gcc			93

<210> 46
<211> 873
<212> DNA
<213> Artificial Sequence

<220>
<223> SEE1 (senescence enhanced) promoter

<400> 46

catggccag	gtataattat	gggatatctc	aagcaaataa	tcgaaatatac	accattggct	60
acaatatctg	agctccgagt	tctgactgca	gtctggatga	cgcgtgttgt	atctagaact	120
ctagatagca	cagccacagc	acctacagga	gtgcgacact	tgtggactgt	agttagtgg	180
gagacggagc	tctttcctac	ctcctgacgt	tgccgccgtt	gtccattcca	acggcatcac	240
tctcaaccaa	tcacgcgctc	ccaacaaaat	atcgcccccc	atgttctggc	ggagagagag	300
tacatacatg	ctgtcgcgcc	gttttgtct	aatctcgct	tccactggcc	aatcagctca	360
gctcccgaaa	gctcactcat	tcaagatccc	atcgctgtcg	tcacccctgg	cgtcatggga	420
tggaaaagaa	cctccgttgc	tcggatgagt	cagccatatac	cccgaacaga	gtactgcaag	480
ataacccaaat	tcagattccc	ccaatagaga	aagtatagca	tgcttcggg	ttttgtttgg	540
cttaatttgc	tttatttttg	ttggagttga	atgctgattt	gttgtgtaaa	atgccccacc	600
atctgaatat	cgagacggat	aataggctgg	ctaattaatt	tatagcaaga	ttctgttagtg	660
cacatcgcaa	atatcttct	ggcattaca	gctggaggct	tcatcagcct	gaaacactct	720
gcagagcctg	aagcaagtgg	tgaagcgtgg	cgatgagatg	ggtataaaac	ccccggcacc	780
gggacgcgag	ctcccgcccta	ccagtaccat	ctcgccctcgc	tccccctgcc	ggacgaccct	840
gtaaaatact	gttgcact	cgccggcgag	atg			873

<210> 47
<211> 39
<212> PRT
<213> Artificial Sequence

<220>
<223> SEE1 promoter plus vacuolar aleurain signal/NPIR sequence

<400> 47

Met	Ala	His	Gly	Arg	Ile	Leu	Phe	Leu	Ala	Leu	Ala	Val	Leu	Ala	Thr
1					5				10				15		
Ala	Ala	Val	Ala	Ala	Ala	Ser	Leu	Ala	Asp	Ser	Asn	Pro	Ile	Arg	Pro
								20		25			30		
Val	Thr	Glu	Arg	Ala	Ala	Ala									
							35								

<210> 48
<211> 987
<212> DNA
<213> Artificial Sequence

<220>
<223> SEE1 promoter plus vacuolar aleurain signal/NPIR encoding sequence

<221> misc_feature
<222> (1)...(987)
<223> n = A,T,C or G

<400> 48

catggccag	gtataattat	gggatatctc	aagcaaataa	tcgaaatatac	accattggct	60
acaatatctg	agctccgagt	tctgactgca	gtctggatga	cgcgtgttgt	atctagaact	120
ctagatagca	cagccacagc	acctacagga	gtgcgacact	tgtggactgt	agttagtgg	180

gagacggagc tcttcctac ctcctgacgt tgccgccgtt gtccattcca acggcatcac	240
tctcaaccaa tcacgcgctc ccaacaaaat atcgcccccc atgtcttggc ggagagagag	300
tacatacatg ctgtcgccgtt gttttgtct gaatctcgct tccactggcc aatcagctca	360
gctcccgaga gctcactcat tcaagatccc atcgtcgctg tcaccctgg cgtcatggga	420
tggaaaagaa cctccgttgc tcggatgagt cagccatatac cccgaacaga gtactgcaag	480
ataacccaat tcagattccc ccaatagaga aagtatagca tgcttcggg ttttgttgg	540
cttaattgac ttatTTTG ttggagttga atgctgattt gttgtgtaaa atgcccAACCC	600
atctgaatat cgagacggat aataggctgg ctaattaatt tatacgcaaga ttctgttagtg	660
cacatcgcaa atatcttct gggcattaca gctggaggct tcattcggct gaaacactct	720
gcagagcctg aagcaagtgg tgaagcgtgg cgatgagatg ggtataaaac ccccgccacc	780
gggacgcgag ctcccgcccta ccagtaccat ctcgcctcgcc tcccccgtcc ggacgaccca	840
gtaaaatact gttggccact cgccggcgag atggcccacg gccgcattct ctcttggcg	900
ctcgccgtct tggccaccgc cgccgtggcc gccgcattct tggcggactc caacccgatc	960
cgccccgtca ccgagcgcgcg ggccggcc	987

<210> 49

<211> 40

<212> DNA

<213> Artificial Sequence

<220>

<223> primer

<400> 49

ggcgccgagg gagtggccgg tcacggtcag cgcgtagttcc

40

<210> 50

<211> 35

<212> DNA

<213> Artificial Sequence

<220>

<223> primer

<400> 50

ccggccacgc cctcgccgccc tccctggccgg cactc

35

<210> 51

<211> 44

<212> DNA

<213> Artificial Sequence

<220>

<223> primer

<400> 51

ctaaagctta ccatggcgac cgcctccacg cagggcatct ccga

44

<210> 52

<211> 50

<212> DNA

<213> Artificial Sequence

<220>

<223> primer

<400> 52

tctaagcttg cggccgcgac cggccaggtg catgcgcgc tcgtcatccc

50

<210> 53

<211> 325
<212> DNA
<213> Artificial Sequence

<220>
<223> amplified nos terminator sequence from pMA406
vector

<400> 53
agactgcaga ccatggcggc cgcgkaacca ctgaaggatg agctgtaaag aagcagatcg 60
ttcaaacatt tggcaataaa gtttcttaag attgaatcct gttgccggtc ttgcgtatgat 120
tatcatataa tttctgttga attacgttaa gcatgtata attaacatgt aatgcgtgac 180
gttattttatg agatgggttt ttatgattag agtcccgcaa ttatacattt aatacgcgtat 240
agaaaacaaa atatacgcg caaacttagga taaattatcg cgcgcggtgt catctatgtt 300
actagatcga taagcttcta gatct 325

<210> 54
<211> 72
<212> DNA
<213> Artificial Sequence

<220>
<223> primer

<400> 54
agactgcaga ccatggcggc cgcgkaacca ctgaaggatg agctgtaaag aagcagatcg 60
ttcaaacatt tg 72

<210> 55
<211> 20
<212> DNA
<213> Artificial Sequence

<220>
<223> primer

<400> 55
aagactgcag accatggcgg 20

<210> 56
<211> 40
<212> DNA
<213> Artificial Sequence

<220>
<223> primer

<400> 56
agatctagaa gcttacgtat ctagtaacat agatgacacc 40

<210> 57
<211> 33
<212> DNA
<213> Artificial Sequence

<220>
<223> primer

<400> 57
ctaggcggcc gcgcgggagg aggcgacggc gac 33

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<210> 58
<211> 36
<212> DNA
<213> Artificial Sequence

<220>
<223> primer

<400> 58
gagggtgtat tcggtatcga gttgcagggtt cgtatc 36

<210> 59
<211> 32
<212> DNA
<213> Artificial Sequence

<220>
<223> primer

<400> 59
ctcgatacc accattaccc cacgccttca ga 32

<210> 60
<211> 10
<212> DNA
<213> Artificial Sequence

<220>
<223> Accl site

<400> 60
gttagtagac 10

<210> 61
<211> 39
<212> DNA
<213> Artificial Sequence

<220>
<223> synthetic oligonucleotide

<400> 61
ctcaccatgg taagcttcta cctacaaaaa agctccgca 39

<210> 62
<211> 36
<212> DNA
<213> Artificial Sequence

<220>
<223> primer

<400> 62
aaccatggcg gccgcgcgct cggtgacggg ccggat 36

<210> 63
<211> 29
<212> DNA
<213> Artificial Sequence

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<220>
<223> primer

<400> 63
ttcgttacca tggccaggta taattatgg                                29

<210> 64
<211> 31
<212> DNA
<213> Artificial Sequence

<220>
<223> primer

<400> 64
ctgcgccggc gagatggmcg tgcacaagga g                                31

<210> 65
<211> 42
<212> DNA
<213> Artificial Sequence

<220>
<223> primer

<400> 65
ggaattcgtt gacaagctt cmatggccca cgcccgctc ct                                42

<210> 66
<211> 55
<212> DNA
<213> Artificial Sequence

<220>
<223> primer

<400> 66
tatccatggc ggccgcgcgg tcggtgacgg gccggmycgg gttggagtcg gcgaa      55

<210> 67
<211> 33
<212> DNA
<213> Artificial Sequence

<220>
<223> primer

<400> 67
ctaggcggcc gcgcggagg aggcgacggc gac                                33

<210> 68
<211> 54
<212> DNA
<213> Artificial Sequence

<220>
<223> primer

<400> 68

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gcgacggcga cggcgccgt ggccagcacg gcgagcgcca ggaggaggac gcgg	54
<210> 69	
<211> 33	
<212> DNA	
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<220>	
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<400> 69	
tcggcgatcg tccttcgtcc tccttcgtcc act	33
<210> 70	
<211> 43	
<212> DNA	
<213> Artificial Sequence	
<220>	
<223> primer	
<400> 70	
actaaatgttta aggagatata acaatgtatcc acaccaacct caa	43
<210> 71	
<211> 45	
<212> DNA	
<213> Artificial Sequence	
<220>	
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ttccatgtatcc cacaccaacc tcaaaaagaa gttctccctc ttcat	45
<210> 72	
<211> 55	
<212> DNA	
<213> Artificial Sequence	
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agagtgtatca cggcgaagag gaggaagacg aggtatgaaga gggagaacct ctttt	55
<210> 73	
<211> 61	
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<213> Artificial Sequence	
<220>	
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tatagatctg cgtgttggaaag aagggttcgg actacgaggc ctttcaccctc caagccaaagg	60
a	61
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<211> 28	

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<212> DNA
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<220>
<223> primer

<400> 74
catttggAAC tccttggCTT ggagggtg                                28

<210> 75
<211> 34
<212> DNA
<213> Artificial Sequence

<220>
<223> primer

<400> 75
aaccatggCG gcccacATT ggaactcCTT ggCT                                34

<210> 76
<211> 61
<212> DNA
<213> Artificial Sequence

<220>
<223> primer

<400> 76
tatAGATCTG cgtgtggAAg aagggctccg actacgaggc cctcaccCTC caagccaagg    60
a                                61

<210> 77
<211> 42
<212> DNA
<213> Artificial Sequence

<220>
<223> primer

<400> 77
ggaattcgtA gacaagctta cmatggmcgt gcacaaggag gt                                42

<210> 78
<211> 37
<212> DNA
<213> Artificial Sequence

<220>
<223> primer

<400> 78
gatcaggagg taggcwacga agttwacCTC ctTgtgc                                37

<210> 79
<211> 37
<212> DNA
<213> Artificial Sequence

<220>

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<223> primer

<400> 79
cctacacctc gatcgtsctc ggccctcctct tgctcgt

37

<210> 80
<211> 43
<212> DNA
<213> Artificial Sequence<220>
<223> primer<400> 80
ccttggcgtc cacgtgctcc atggcggawa cgagcaagag gag

43

<210> 81
<211> 39
<212> DNA
<213> Artificial Sequence<220>
<223> primer<400> 81
gtggacgcca aggcctgcac cckcgagtgc ggcaacctc

39

<210> 82
<211> 47
<212> DNA
<213> Artificial Sequence<220>
<223> primer<400> 82
ggaattcgcg gcccggggc agatgccgaa gccgaggttg ccgcact

47

<210> 83
<211> 32
<212> DNA
<213> Artificial Sequence<220>
<223> primer<400> 83
ctaaagctta acatgaagca gttctccgcc aa

32

<210> 84
<211> 8
<212> DNA
<213> Oryza sp.<400> 84
gtaggtag

8

<210> 85
<211> 7
<212> PRT

<213> Artificial Sequence

<220>

<223> KDEL fusion peptide

<400> 85

Lys	Pro	Leu	Lys	Asp	Glu	Leu
1				5		

<210> 86

<211> 7

<212> PRT

<213> Artificial Sequence

<220>

<223> designated KDEL fusion peptide

<400> 86

Glu	Pro	Leu	Lys	Asp	Glu	Leu
1				5		

<210> 87

<211> 5

<212> PRT

<213> Artificial Sequence

<220>

<223> frameshifted terminal peptide

<400> 87

Glu	Thr	Thr	Glu	Gly
1			5	

<210> 88

<211> 27

<212> PRT

<213> Aspergillus niger

<400> 88

Met	Lys	Gln	Phe	Ser	Ala	Lys	His	Val	Leu	Ala	Val	Val	Val	Thr	Ala
1				5				10					15		
Gly	His	Ala	Leu	Ala	Ala	Ser	Thr	Gln	Gly	Ile					
			20				25								

<210> 89

<211> 9

<212> PRT

<213> Aspergillus niger

<400> 89

Met	Ala	Ala	Ala	Ser	Thr	Gln	Gly	Ile
1				5				

<210> 90

<211> 7

<212> PRT

<213> Artificial Sequence

<220>

<223> ER retention vector

<400> 90
Lys Pro Leu Lys Asp Glu Leu
1 5

<210> 91
<211> 5
<212> PRT
<213> Artificial Sequence

<220>
<223> c-terminal targeting sequence

<400> 91
Pro Val Ala Ala Ala
1 5

<210> 92
<211> 55
<212> DNA
<213> Artificial Sequence

<220>
<223> primer

<400> 92
tatccatggc ggccgcgcgg tcgggtacgg gccggcccggttggagtcg gcgaa 55

<210> 93
<211> 8
<212> PRT
<213> Artificial Sequence

<220>
<223> ferulic esterase end

<400> 93
Cys Thr Trp Pro Val Ala Ala Ala
1 5

<210> 94
<211> 72
<212> PRT
<213> Artificial Sequence

<220>
<223> pTP4a2 vector

<400> 94
Met Lys Gln Phe Ser Ala Lys His Val Leu Ala Val Val Val Thr Ala
1 5 10 15
Gly His Ala Leu Ala Ala Ser Thr Gln Gly Ile Ser Glu Asp Leu Tyr
20 25 30
Ser Arg Leu Val Glu Met Ala Thr Ile Ser Gln Ala Ala Tyr Ala Asp
35 40 45
Leu Cys Asn Ile Pro Ser Thr Ile Ile Lys Gly Glu Lys Ile Tyr Asn
50 55 60
Ser Gln Thr Asp Ile Asn Gly Trp
65 70

<210> 95
<211> 17
<212> PRT
<213> Artificial Sequence

<220>
<223> protein encoded by functional reading frame

<400> 95
Tyr Ala Leu Thr Val Thr Gly His Ser Leu Gly Ala Ser Leu Ala Ala
1 5 10 15
Leu

<210> 96
<211> 17
<212> PRT
<213> Artificial Sequence

<220>
<223> protein encoded by inactivated reading frame

<400> 96
Tyr Ala Leu Thr Val Thr Gly His Ala Leu Gly Ala Ser Leu Ala Ala
1 5 10 15
Leu

<210> 97
<211> 4
<212> PRT
<213> Artificial Sequence

<220>
<223> retention sequence

<400> 97
Lys Asp Glu Leu
1